

44#43

11 June 1956

MEMORANDUM FOR: THE RECORD

SUBJECT : Project Monitors at [REDACTED]
RD-61ss, Tasks I - IV

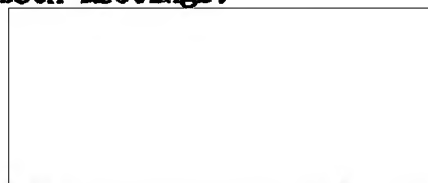
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1. Time and Place of Meetings: The meetings were held at the [REDACTED] on 24 and 31 May 1956.

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2. Attendance:

At both meetings:



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In addition, at the 31 May meeting:



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3. Purpose of Meetings: The meetings were held to review progress on the various [REDACTED] projects. In particular, the following were discussed:

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Ad Hoc #6 - [REDACTED]
Ad Hoc #43 [REDACTED]
RS-1 & 2 - Radio Switch
Specifications for -
ST-2
J-163C & D
RC-1

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4. Discussion:

The discussion of AH-6, AH-43, and RS-1 follows on separate sheets for ease of filing. In addition, a preliminary outline of environmental tests for the various production items such as the ST-2, RC-1, J-163C is appended. Much further work is required on the statement of these tests, especially regarding the performance of the equipment when the units are operating satisfactorily.

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a. Ad Hoc #6 - [] Project

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Progress on Ad Hoc #6 has been very slow. The first breadboard is still unpackaged and still has noticeable harmonics up to and including the seventh at 595 kc in the low end of the broadcast band. No quantitative measurements of the harmonics have been made.

An improper test was run between [] office and the basement in the [] with unsatisfactory results. A great deal of noise was present. The cure suggested by [] improvement of the present 10 mv receiver sensitivity to increase limiting.

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It appears that pressure should be applied to [] on this project. To quote the memo for the Record of 4 April 1956:

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"Progress on this project has been slight. The [] receiver has been shifted to 85 kc and transformers for this frequency have been wound for the transmitter. A low pass filter is being designed.

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[] was requested to have the unit at 85 kc with the low pass filter packaged in the condenser can by 1 May. At that time the [] machine should have arrived and the installation can be made."

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The [] machine indeed did arrive, but that seems to be about all that has happened since 4 April. During that time, [] has been on the project full time. [] has been supervising or at least he was supposed to be supervising.

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There is no reason why quantitative measurements of the harmonics both on the line and radiated could not have been made. There is no reason why a definite report on the harmonic situation could not have been ready. There is not any reason why the noise difficulties and receiver insensitivity could not have been found before the APD visit. In short, pressure needs to be brought to bear on Ad Hoc #6.

b. Ad Hoc #43 - []

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This meeting was held to acquaint [] with the present status of the [] work and to coordinate the joint efforts of both companies.

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[] delivered a finished 7000 ohm transducer to [] The unit has a linearity of about $\pm 1\%$.

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[] has had [] on the project for several weeks. Preliminary experiments have been made on a ferrite rod antenna operating about 2-5 mc. and installed [] It appears that such an antenna is feasible []

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[] has done some thinking on the scheme of modulation to be used. Presently frequency shift modulation with a shift of 100 cps [] or a total shift of 4 kc, is being considered. Air input power to the antenna of about 10 to 50 mw. and a life of 1 month are also design goals.

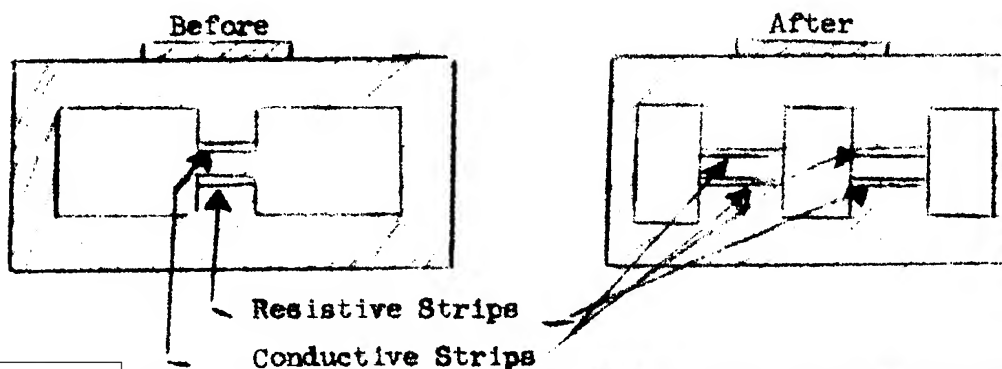
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Since an average operating time of 4 hours per day is believed to be reasonable, it is apparent that a switching system allowing the monitor to be completely shut off when the [] is not in use will save a factor of 1/6 in battery size. To make this saving possible, [] has been requested to try the following modification in the transducer.

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[] will report by 30 June the feasibility of this change. The basic decoder work at [] will be continued after the transducer modification. A thorough investigation of commercially available [] will be made. If possible, a complete [] decoder will be built although the present contract does not require it due to an extension of scope without increase of funds.

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c. RS-1 and 2 - Radio Switch Receivers

The complete breadboard of the RS-1 was demonstrated at the 24 May monitor. The unit operates on a 14.8 mc carrier amplitude modulated at 3200 cps. A signal of 10 μ volts is more than sufficient for reliable operation. The unit will not

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operate on a 10 mv signal for carriers more than 0.1 mc away from 14.8 mc. or audio modulation more than 50 cps from 3200 cps. No tests were made on radiation from the receiver local oscillator since a fair test cannot be made until the receiver is properly packaged and shielded.

Printed circuit boards have been designed and are being constructed for the unit.

An R&D requirement describing the operational characteristics of both units is enclosed with this memo.

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Appendix Notes on
Environmental Tests for ST-2 Transmitter

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I Vibration

Cycling:

Vibrate equipment, in operating condition with output monitored, from 5 to 60 cps, 0.016" double amplitude; making one cycle in 10 minutes. Make two cycles. Locate resonances.

Resonance:

Vibrate equipment at the resonance most likely to produce failure for 1 hour or divide the time equally between resonances if more than one exists.

Repeat above for all three mutually perpendicular planes.

Follow up with visual and electrical tests to determine fatigue or damage.

(The exact method of determining resonances to be left to Both visual and electrical means to be employed.)

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II Shock Test

The shock tests shall be conducted by dropping the units three feet onto a concrete floor covered with asphalt tile. The units shall not be packed for shipment or protected in any way.

One unit from each production lot shall be dropped one time in each of three mutually perpendicular planes and three times on arbitrary corners. All other units shall be dropped once with the floor covered with cloth to protect the finish of the units.

III Temperature Test

a. Non-operating Test

The equipment shall be subjected to temperatures of -54°C and $+71^{\circ}\text{C}$. For a period of 12 hours after equilibrium has been attained.

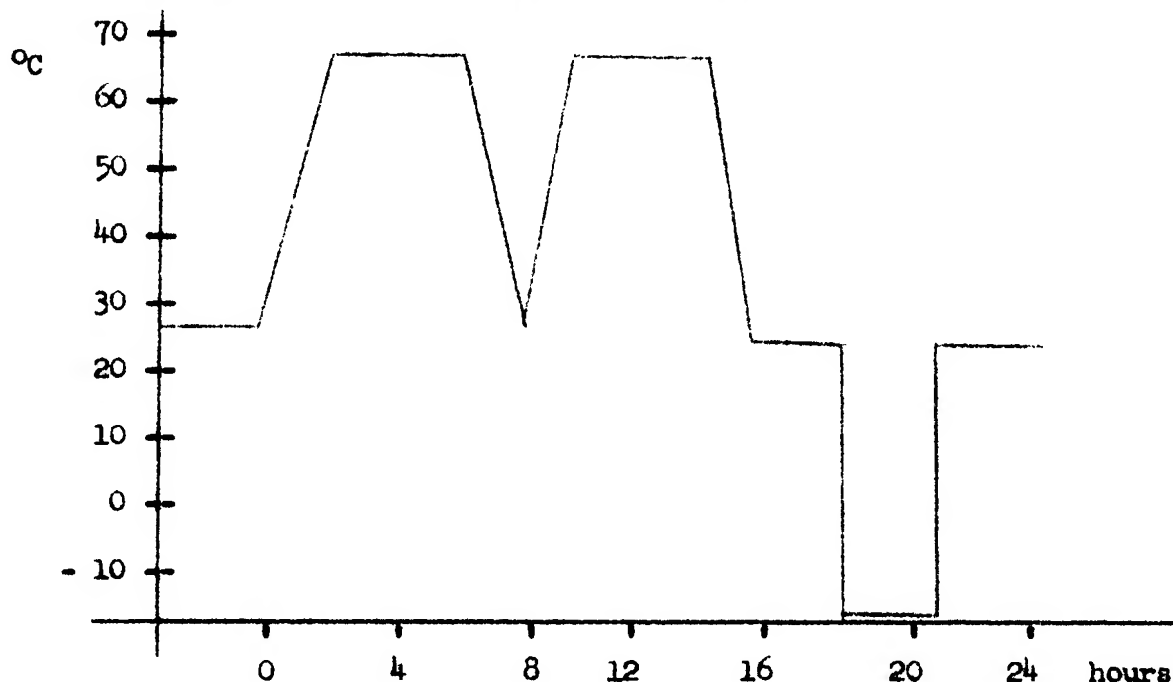
b. Operating Test

The equipment shall be tested while operating at temperatures of $+5^{\circ}\text{C}$ and $+50^{\circ}\text{C}$. The equipment shall be brought to equilibrium at the temperatures above before testing. (Tests will be devised to cover the stability, audiogain and output power.)

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IV Humidity

One unit from each production lot shall be subjected to 10 cycles of the following test. Equipment shall be on during test and shall operate satisfactorily immediately following end of test.

V Altitude Test

Equipment shall be subjected to altitude of 30,000 feet for one hour. Equipment shall then be operated satisfactory at room temperature. (The definition of "satisfactory operation" must be pinned down.)

5. Actions:

a. Put pressure on to complete Ad Hoc #6.

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b. Follow up on the reports on all 4 research projects which are due 4 June 1956. (Carl has been reminded of the date.)

TSS/APD

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Distribution:

P-77 - 1
AH-6 - 1
AH-43 - 1
P-163B - 1
P-163C - 1
P-163D - 1
Chrono - 1

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R&D Requirement for Radio Switch Systems
RS-1 and RS-2

1. General

Radio Switch Systems RS-1 and RS-2 shall consist of Radio Switch Receivers RSR-1 and RSR-2 and companion transmitters RST-1 and RST-2. The complete systems shall provide a means for remote control of various small electrical devices. Model RS-1 shall be a battery powered portable version requiring a continuous carrier in the "on" position. Model RS-2 shall be line powered and shall require carrier excitation only when being switched from "on" to "off" or vice versa.

2. Specific

a. RS-1 System

(1) Frequency

The system shall operate in the 15 mc band.

(2) Modulation

The system shall utilize a carrier amplitude modulated at 3200 cps. The carrier shall be modulated more than 60% and less than 100%.

(3) Transmitter Output

The RST-1 shall deliver 50 mw average power to the antenna.

(4) Receiver Sensitivity

The RSR-1 shall operate reliably with a carrier input of 10 μ volt and 60% 3200 cps modulation.

(5) Antennas

The RS-1 units shall use antennas approximately 1 meter long.

(6) Power Supply

The RSR-1 shall operate continuously for 7 days at 70° F from a battery supply. The RST-1 shall operate 4 hours at 70° F from a battery supply. All battery supplies shall be contained within the respective units.

(7) RSR-1 Output

The RSR-1 shall be equipped with a SPST relay having contacts capable of carrying 110 vac at 0.5 ampere non-inductive load

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current. A suitable two conductor cable and connectors shall be provided for the relay output.

(8) Package Size and Form Factor

The RST-1 shall be as small as possible and shall have a form factor approximately 1:5:10. The RSR-1 shall be similar in size and shape to the RST-1 but minimum size is not of major importance.

(9) Application

The RS-1 system shall be applied to the control of units not capable of furnishing a return signal such as a remotely operated camera.

b. RS-2 System

(1) Frequency

Same as RS-1

(2) Modulation

Same as RS-1

(3) Transmitter Output

The RST-2 shall deliver 10 watts average power to the antenna.

(4) Receiver Sensitivity

Same as RS-1

(5) Antennas

The RST-2 shall use a half wave dipole. RSR-2 shall use a wire antenna about 1 meter long.

(6) Power Supply

The RS-2 system components shall have power supplied which operate from any voltage in the range 75 to 240 volts 50 cps. The supplies shall be regulated and maintain sufficient regulation so that the above range of voltage may be covered by choosing between 6 nominal input voltages or less (regulation over about $\pm 10\%$ of the nominal input voltage).

(7) RSR-2 Output

The RSR-2 shall be equipped with a SPST relay having contacts capable of carrying 110 vac at 0.5 ampere non-inductive load current. The relay terminals shall be connected in series with the line voltage and a standard 110 volt female receptacle.

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(8) Package Size and Form Factor

The RSR-2 shall correspond in size and shape to the RSR-1.
The size and shape of the RST-2 shall be unrestricted.

(9) Application

The RS-2 system shall be applied chiefly to the control of
[redacted] transmitters such as the ST-2, J-163C,
and J-163D.

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3. Models

One model of each of the complete RS-1 and RS-2 systems shall be constructed as evaluation prototypes and shall be completed as soon as convenient. It is anticipated that a quantity of units will be ordered following acceptance of the design.

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